HEXAMETHYLPHOSPHORAMIDE

Hexamethylphosphoramide is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 680-31-9 $[(CH_3)_2N]_3PO$

Molecular Formula: $C_6H_{18}N_3OP$

Hexamethylphosphoramide is a clear, colorless liquid with an aromatic odor. It is miscible with water and most organic liquids, except for high boiling saturated hydrocarbons. It does not hydrolyze in alkaline media, but hydrolyzes slowly in acids. When heated to decomposition, it emits toxic fumes of phosphorus oxides and nitrogen oxides (NTP, 1994a).

Physical Properties of Hexamethylphosphoramide

Synonyms: hexamethylphosphoric triamide; Hempa; HMPA; HMPT; ENT; hexametapol

Molecular Weight:	179.20
Boiling Point:	233 °C
Melting Point:	5 - 7 °C
Vapor Density:	6.18 (air = 1)
Density/Specific Gravity:	1.03 at 20/4 °C (water = 1)
Vapor Pressure:	0.03 mm Hg at room temperature
Conversion Factor:	1 ppm = 7.33 mg/m^3

(HSDB, 1991; Merck, 1983; Sax, 1987; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Hexamethylphosphoramide is used as a processing solvent for aromatic polyamide fibers, as a solvent for polymers and in organic and organometallic reactions in research labs, as a selective solvent for gases, and as a polymerization catalyst (HSDB, 1991). It is also used as an ultraviolet inhibitor in polyvinyl chloride, a de-icing additive for jet fuel, and as a chemical mutagen (NTP, 1994a).

B. Emissions

No emissions of hexamethylphosphoramide from stationary sources in California were reported, based on data obtained from the Air Toxics Hot Spots Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of hexamethylphosphoramide was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of hexamethylphosphoramide.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of hexamethylphosphoramide was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

No information about the atmospheric persistence of hexamethylphosphoramide was found in the readily-available literature.

AB 2588 RISK ASSESSMENT INFORMATION

Hexamethylphosphoramide emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics Hot Spots Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to hexamethylphosphoramide are inhalation, ingestion, and dermal contact.

Non-Cancer: No information is available on the acute or chronic effects of inhalation overexposure to hexamethylphosphoramide in humans. Effects on the kidneys and lungs have been reported in animals following acute oral exposure. An increased incidence of lung disease has been reported in animals chronically exposed through the oral route (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) is reviewing a Reference Concentration (RfC), and has not established an oral Reference Dose (RfD) for hexamethylphosphoramide (U.S. EPA, 1994a).

No information is available on developmental or reproductive effects of hexamethylphosphoramide in humans. Adverse reproductive function effects including reduced fertility, reduction in sperm count, and significantly reduced testicular weights from oral exposure to hexamethylphosphoramide have been reported in animal studies (U.S. EPA, 1994a). The State of California has determined under Proposition 65 that hexamethylphosphoramide is a male reproductive toxicant (CCR, 1996).

Cancer: No information is available on the carcinogenic effects of hexamethylphosphoramide in humans. An increased incidence of nasal tumors from inhalation exposure to hexamethylphosphoramide has been reported in animal studies. The U.S. EPA has not classified hexamethylphosphoramide with respect to carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified hexamethylphosphoramide in Group 2B: Possible human carcinogen (IARC, 1987a). The State of California has determined under Proposition 65 that hexamethylphosphoramide is a carcinogen (CCR, 1996).